Five-Year Review Report

for
Ionia City Landfill Superfund Site
Ionia County
Ionia, Michigan

September 2005

PREPARED BY:

United States Environmental Protection Agency
Region 5
Chicago, Illinois

Approved by:

Richard C. Karl, Director
Superfund Division

Date:

9/29/05

Table of Contents

APPENDIX A – FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

APPENDIX B – COPY OF FIVE-YEAR REVIEW AD

APPENDIX C – IC STUDY REPORT (Summary w/o attachments)

List of Acronyms

CIC	Community Involvement Coordinator
CFR	Code of Federal Regulations
IC	Institutional Controls
ISV	In-situ vitrification
LTMNA	Long Term Monitored Natural Attenuation
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MNA	Monitored natural attenuation
O&M	Operation and Maintenance
PRPs	Potentially Responsible Parties
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
USEPA	United States Environmental Protection Agency
VAS	Vertical Aquifer Sampling

Executive Summary

The remedies for the Ionia City Landfill in Ionia County, Michigan, included: insitu-vitrification (which was not implemented due to operational issues), source removal of wastes and contaminated soil from Area A in the landfill, capping and vegetating the landfill cap and the installation of a pump and treat system to capture and treat the contaminated groundwater plume caused from the source in Area A.

The trigger for this Five-Year Review is the sign off on the Record of Decision (ROD) that implemented the groundwater remedy (September 28, 2000).

The assessment of this Five-Year Review determined that a threat in relation to direct soil contact no longer exists at the Ionia City Landfill Site due to the removal of the source area, the installation of fencing around the area with posted signage and capping of the landfill. However, regarding the existing contaminated groundwater plume, there is not enough information available to determine if the current pump and treat system is adequately capturing the contaminated groundwater plume as defined in the ROD. This pump and treat system has begun functioning at a higher level in the recent past, but it will require additional monitoring to determine the exact extent of the plume and whether additional recovery wells are necessary at the Site to fully capture the plume. Therefore, a protectiveness determination of the groundwater remedy at the Site cannot be made at this time until further information is obtained. It is anticipated that these actions will take approximately one year to complete, at which time a protectiveness determination will be made.

Executive Summary
Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Ionia City Landfill		
EPA ID *(from WasteLAN)*: MID980794416		
Region: V	**State:** MI	**City/County:** Ionia, Ionia County
SITE STATUS		
NPL status: •Final □Deleted □Other (specify)		
Remediation status (choose all that apply): □Under Construction • Operating □Complete		
Multiple OUs?* □ YES • NO	**Construction completion date:** 09/28/2000	
Has site been put into reuse? □YES •NO		
REVIEW STATUS		
Lead agency: • EPA □State □Tribe □Other Federal Agency		
Author name: Demaree Collier		
Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA, Region V	
Review period:** January 2005 to August 2005		
Date(s) of site inspection: 7/13/2005		
Type of review: •Post-SARA □ Pre-SARA □NPL-Removal only □Non-NPL Remedial Action Site □NPL State/Tribe-lead □Regional Discretion		
Review number: •1 (first) □2 (second) □3 (third) □Other (specify)		
Triggering action: □Actual RA Onsite Construction at OU #___ □Actual RA Start □Construction Completion □Previous Five-Year Review Report •Other (specify) – Signing of the ROD implementing the groundwater remedy		
Triggering action date *(from WasteLAN)*: 09/28/2000		
Due date *(five years after triggering action date)*: 09/28/2005		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form cont'd.

Issues:

- Lack of groundwater plume capture implied by stable contaminant concentrations (operational issues with the pump and treat system)
- Plume not fully defined per guidance documents that govern sites implementing monitored natural attenuation
- Hydraulic conductivity appears to be incorrectly calculated
- Confirming that no private wells exist down gradient of the Site that would be affected by the contaminated groundwater plume
- Obtaining restrictive covenant for Area A and current recreational path as part of the institutional controls (ICs) and follow up IC study findings
- Meeting the standards set forth in the Mixing Zone Determination of the 2000 ROD for the Grand River and Kanouse Drain

Recommendations and Follow-up Actions:

- Hydraulic conductivity evaluation of existing data at each well
- Hydraulic conductivity testing at selected wells within the network
- Develop a site-wide groundwater flow and contamination transport model
- Vertical Aquifer Sampling in areas to define extent of plume
- Continue quarterly sampling of all the selected monitoring wells along with measurement of the groundwater elevation at each well
- Operation and maintenance system improvements including increased recovery rates and area coverage (if needed)
- Monitoring well network expansion to allow for MNA
- Assess drinking water wells down-gradient of the Site (as precautionary measure)
- Obtain and review a copy of the restrictive covenant for the Site
- Review and comply with State ARAR for Mixing Zone Determination
- Review IC Study Report for adequacy of restrictive covenants on the entire Site, as well as adjacent properties and revise accordingly

Protectiveness Statement(s):
Due to the removal of the source area, the need for further soil remediation at the Site has been eliminated as stated in the 2000 ROD. Yet, a protectiveness determination of the remedy at the Site cannot be made at this time until further information is obtained due to the contaminated groundwater plume. Further information will be obtained by continued monitoring of the Site's contaminated groundwater plume as described in the above Recommendations and Follow-up Action. It is anticipated that these actions will take approximately one year to complete, at which time a protectiveness determination will be made.

I. Introduction

The United States Environmental Protection Agency (U.S. EPA) Region 5 has conducted a Five-Year Review of the remedial actions implemented at the Ionia City Landfill in Ionia, Michigan. The review was conducted between January 2005 and September 2005. This report documents the results of the Five-Year Review. The purpose of a Five-Year Review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of the review are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and make recommendations to address them.

This review is required by statute. U.S. EPA performs statutory reviews on remedies selected that result in hazardous substances, pollutants or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure.

The NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

This is the first Five-Year Review for the Ionia City Landfill Superfund Site. The review is based on the initiation of the remedial action response date for the Site, which was September 2000.

II. Site Chronology

mid 1950s – 1970s	Disposal site for municipal and industrial wastes
June 1981	Excavation of approximately 100 drums containing industrial solvents by Michigan Department of Environmental Quality (MDEQ) and the City of Ionia
1981 – 1987	USEPA and MDEQ performed numerous sampling events to determine drum contents, possible surface water and sediment contamination and possible groundwater contamination
September 8, 1983	Final listing on USEPA's National Priorities List
1984 – 1985	City of Ionia secured Site, removed and disposed of exposed drums in Area A and placed a clay cap over excavated area
1986	USEPA entered into an agreement with the Potentially Responsible Parties (PRPs) to conduct an Remedial Investigation/Feasibility Study (RI/FS)
1987 – 1989	PRPs conducted and completed an RI/FS at Site

September 29, 1989	Record of Decision (ROD) signed which included in-situ vitrification (ISV) of source area at Site
1991	PRPs signed consent decree to implement the ISV
1993 – 1994	ISV bench-scale testing problematic and significantly delayed and the practice itself became questionable
October 24, 1994	Administrative Order signed with PRPs to implement soil removal action
1994 - 1995	PRPs conducted a removal action for the point source – backfilled and capped area of point source as part of the Administrative Order
June 13, 1995	Administrative Order signed with PRPs to contain groundwater as part of another removal action
1995 - 1997	PRPs implemented removal action to install a groundwater pump and treat system to capture and treat contaminated groundwater exceeding
1999	Pump and treat system began capturing and treating groundwater as an interim action
September 28, 2000	ROD signed to address contamination in the upper aquifer with the current pump and treat system
2000 – present	Continued monitoring of groundwater contaminant plume
2002	Entered into Consent Decree for the implementation of the 2000 ROD
2003	Treatment of contaminated groundwater terminated due to levels of contamination below that required for City of Ionia's Wastewater Treatment Plant

III. Background

Physical Characteristics

The former Ionia City Landfill Superfund Site is located in Ionia County, Michigan (see Figure 1). The Site, which is owned by the City of Ionia, is situated on approximately 20 acres of land located within the floodplain of the Grand River and is bounded by Cleveland Street to the west, the Grand River to the south, a mixed residential and light commercial area to the north, and to the east by a tributary to the Grand River known as the Kanouse Drain and a wetland. The Site itself consists of an older fill area (Area A) in the northern portion, and a more recent fill area (Area B) in the southern portion of the Site. The two areas are divided by the right-of-way of the Chesapeake and Ohio Railroad, which is currently a recreational path. The entire Site is generally flat with Area A covered mainly in thick grass, while Area B is covered in scrub brush and has developed some wooded areas, especially along the banks of the Kanouse drain and the Grand River. Area A is enclosed by a chain link fence with warning signs attached and an access gate located on Cleveland Street, while

Area B is fenced along Cleveland Street, but not along the Grand River or the eastern boundary of the Kanouse Drain.

Land and Resource Use

The Ionia City Landfill was owned and operated by the City of Ionia and used as a disposal site for municipal, commercial and industrial wastes, including drummed liquids, from the mid- to late-1950s until it was closed in 1968 or 1969. While the landfill was in operation in 1965, an explosion occurred during the burning of wastes and a waste hauler was killed. In 1966 the Michigan Department of Natural Resources (MDNR) classified the landfill as an open dump. Although the landfill was closed, additional waste continued to be disposed at the Site through the 1970s. Today, the landfill is zoned "light industrial". The recreational path that separates Area A from Area B is used by walkers and bicyclists and three wetland areas have been identified either on or adjacent to the Site. Two municipal wells are located more than a mile from the Site, the first one being approximately 1-2 miles up-gradient of the Site and the other is approximately 2 miles southwest of the Site, across the Grand River. It is not anticipated that any contamination from the Site would impact these wells.

History of Contamination

The Ionia City Landfill accepted industrial and municipal wastes during its period of operation. Additional wastes were disposed at the Site after it was closed in the 1970s. Numerous drums were found at the Site that contained various types of industrial solvent and paint thinners. These wastes and other bulk wastes that were landfilled at the Site contaminated surrounding soil and groundwater, leading the Site to NPL listing in September 1983.

Initial Response

Representatives from MDNR and the City of Ionia addressed the immediate Site problems during June 1981. Approximately 100 drums containing both solid and liquid material were removed from Area A. Ten of the drums were sampled and found to contain paint thinners and solvents including trichloroethylene, methylene chloride, styrene, toluene and xylene. Beginning in 1981, the USEPA and MDNR performed several sampling events in an attempt to determine drum contents, possible surface water and sediment contamination and possible groundwater contamination. In June 1985, additional drums were found and removed and a security fence was installed and warning signs posted at the Site. An agreement was reached with two potentially responsible parties (PRPs) to perform a RI/FS, which was completed in 1989. An initial ROD was signed in 1989 that called for various activities, including ISV of the point source area. A consent decree was signed in 1991 to implement the ISV, but bench-scale testing indicated that this remedy would not succeed at this Site. In the meantime, it became apparent to USEPA and the MDEQ that the point sources were releasing contaminants to the shallow groundwater aquifer. Therefore, in October 1994, USEPA entered into an Administrative Order with the PRPs to implement a removal action of the source area. Approximately 12,250 tons of waste material and contaminated soils were removed in 1994-1995 to fulfill the terms of this removal action.

Basis for Taking Action

The PRRs conducted a remedial investigation from 1987 to 1989 at the Site. Based on these site investigations, two primary types of contamination releases were found to exist at the Site: 1) runoff to the drainage ditch (Kanouse Drain) and to the Grand River; and 2) percolation of leachate from the landfill to the shallow aquifer beneath the Site. Analytical results indicated the presence of inorganics in both the Kanouse Drain and the Grand River and inorganics and organics in the shallow aquifer beneath the Site. The following list indicates various contaminants and their concentration ranges found during Site investigations:

- Grand River – Calcium at levels ranging from 82,500 to 92,400 µg/l, magnesium ranging from 21,800 to 24,900 µg/l, and sodium concentrations ranging from 14,200 to 17,400 µg/l, adjacent to or downstream of the Grand River;

- Kanouse Drain - Calcium at levels ranging from 100,000 to 124,000 µg/l, methylene chloride ranging from 10 to 11 µg/l, 1,1 dichloroethane detected at 13 µg/l, 1,2 dichloroethylene ranging from 13 to 42 µg/l, and vinyl chloride detected at 23 µg/l were found in the Kanouse Drain. Iron, lead and manganese were found at levels exceeding the U.S. EPA water quality criteria;

- Groundwater –During 1992-1995 and in 1999, vinyl chloride maximum concentrations ranged from 190 to 640 µg/l, chloroethane maximum concentrations ranged from no detect to 1,400 µg/l, methylene chloride maximum concentrations ranged from non-detect to 93,000 µg/l, 1,1-dichloroethene maximum concentrations ranged from 2 to 83 µg/l, 1,1-dichloroethane maximum concentrations ranged from 260 to 1,400 µg/l, 1,1,1-trichloroethane maximum concentrations ranged from 340 to 410 µg/l, trichloroethene maximum concentrations ranged from 7,400 to 8,200 µg/l, and toluene maximum concentrations ranged from 3 to 640 µg/l.

The RI found that exposure to the groundwater could cause significant human health risks since contaminant concentrations found in the groundwater were above the U.S. EPA's acceptable risk range.

IV. REMEDIAL ACTIONS

Remedy Selection

The first ROD was signed on September 29, 1989. That ROD addressed only the source and soil contamination component at the Site. The major components of the 1989 ROD included:

- ISV of the defined point source area;
- Fencing of the Site to restrict access;
- Placement of wells in the aquifer (A-1 aquifer) immediately down-gradient of the point source area;
- Institutional controls to restrict the use of the Site; and
- Upgrading of the landfill cover and repairing side slopes.

The ISV work to be performed under the 1989 ROD did not occur due to problems with bench-scale testing at the Site. Groundwater was continuously monitored during this time and it was found that groundwater quality immediately down-gradient of the point source had been impacted by the waste material (primarily VOCs). An Administrative Order was signed on October 24, 1994, by the PRPs to conduct a removal action of the contaminated soil and waste material in the point source area. On June 13, 1995, another interim response was initiated to contain contaminated groundwater through the implementation of a pump and treat system.

A second ROD was signed on September 28, 2000, to address the contamination of the groundwater in the aquifer (A-1). The provisions of this ROD required the continued use of the pump and treat system installed during the interim action to contain and treat contaminated groundwater with total VOC levels above 500 µg/l, along with Site maintenance and implementing institutional controls to restrict exposure to potential hazards at the Site. Maintenance of the Site included vegetative cover and perimeter fencing with appropriate signage. ICs included use of deed restrictions to control development on the property and continued or enhanced controls to prevent future used of the contaminated groundwater. Residential development in Areas A and B is prohibited, but commercial or industrial development of Areas A and B would be allowed so long as it does not adversely impact the groundwater remediation at the Site. This ROD also stated that due to the removal of the source area, the need for further remediation of the soil had been eliminated.

The following table presents the most important contaminants of concern and the federal and state standards that are to be met under the 2000 ROD:

Contaminants of Concern and Standards Table

	Federal Maximum Concentration Limit (ug/L)	Grand River Chronic GSI Discharge Limit (ug/L)	Grand River Acute GSI Discharge Limit (ug/L)	Kanouse Drain Chronic GSI Discharge Limit (ug/L)	Kanouse Drain Acute GSI Discharge Limit (ug/L)
trichloroethene	5	N/A	3,500	200	3,500
cis-1,2-dichlorethene	70	N/A	11,000	620	11,000
1,1-dichloroethane	N/A	N/A	N/A	740	N/A
vinyl chloride	2	N/A	N/A	15	N/A
arsenic	50	N/A	N/A	150	N/A
chromium	100	N/A	3,700	240	3,700
copper	1,300	N/A	99	30	99
manganese	50*	N/A	5,300	1,200	5,300
zinc	N/A	N/A	1,100	560	1,100

* secondary MCL

Remedy Implementation

In 1991, 18 PRPs signed a consent decree to implement the ISV technology to treat the contaminated soil at the Site as specified in the 1989 ROD. A groundwater remedy was deferred at this time. In 1992, the point source area was prepared for ISV and all intact drums were removed and transported off-site for disposal. Some drums were damaged during this process and their contents spilled out into the soils of the point source area. In late 1993, the ISV was bench-scale tested and operational issues were encountered, so it was determined that ISV would not be appropriate to use at the Site.

During this time period it was found that the groundwater had been impacted by the contents of the drums in the point source area. There was concern about the potential of the contaminated groundwater impacting the Grand River. It was determined that if groundwater was allowed to remain uncontrolled, it would present an imminent and substantial endangerment to human health and the environment. Therefore, on October 24, 1994, the PRPs signed an Administrative Order to implement a soil removal action.

In late 1994, the PRPs conducted a removal action at the point source area and approximately 12,267 tons of waste material and contaminated soils were excavated, transported off-site, and disposed of at a RCRA-approved, CERCLA-compliant facility. Clean sand was used to backfill the excavated area and an 18-inch clay cap was placed over the area and seeded. This removal of the contaminated point source eliminated the need for ISV or any other soil remedy at the Site.

On June 13, 1995, the PRPs signed another Administrative Order to conduct a removal action which would serve as an interim measure regarding the groundwater contamination. A pump and treat system was installed to contain and treat the groundwater plume, defined by the 500 µg/l isocontour, contaminated by VOCs. On September 28, 2000, a second ROD was signed to implement the final groundwater remedy.

The groundwater remedy as outlined in the 2000 ROD consisted of using the existing pump and treat system to treat the contaminated groundwater in the A-1 Aquifer located in Area A. Groundwater would be pumped through several extraction wells and then pumped to a central holding tank located on-Site. The groundwater was then treated through air-stripping and then discharged to the local POTW. In 2003 it was determined that the air-stripper was no longer needed to treat the groundwater and was taken offline. The 2000 ROD selected monitored natural attenuation as the remedy for the contaminant plume outside of the influence of the pump and treat system (which is less than the 500 µg/l isocontour – specifically Area B).

System Operation/Operation and Maintenance

The PRPs are conducting long-term monitoring and maintenance at the Site. The original O&M Plan was approved by U.S. EPA on May 28, 1998, and O&M commenced in May 1999 with the start up of the pump and treat system. An amended O&M Plan was approved in 2002 to take into account the long term response action by the PRPs. The primary activities associated with O&M include the following:

- Visual inspection of the cap with regard to vegetative cover, settlement, stability, and any need for corrective action;
- Inspection of the Kanouse Drain for debris blockage;
- Inspection of the condition of groundwater monitoring wells and recovery wells;
- Routine inspections of the pump and treat system;
- Providing groundwater elevation monitoring to help evaluate the hydraulic capture boundary of the extraction well system; and
- Collection of groundwater quality data that will be used in conjunction with static water elevation data to differentiate the 500 µg/l total VOC plume with the zone of capture.

The primary cleanup of the Ionia City Landfill occurred in 1994/95 when the contaminated soils were removed (source area). The remaining components of the cleanup are the pump and treat system to address the VOC contaminant plume exceeding the 500 µg/l risk level and the MNA to address anything below the 500 µg/l level

(primarily Area B). Therefore, as indicated in the planned elements above, the primary O&M activities have been geared toward the monitoring of groundwater at the Site.

O&M Cost Table

	2000	2001	2002	2003	2004
Total O&M Costs*	$85,270	$109,937	$100,621	$85,812	$78,799

* Costs are approximate

V. PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This is the first Five-Year Review being conducted for the Ionia City Landfill Site.

VI. FIVE-YEAR REVIEW PROCESS

Administrative Components

The EPA Remedial Project Manager (RPM), Demaree Collier, notified MDEQ and the PRPs of the initiation of the five-year review process on March 2, 2005. The RPM headed the Five-Year Review Team and was assisted by MDEQ (Project Manager: Cindy Fairbanks and Geologist: Bill Bolio) and by U.S. EPA's Contractor, Weston Solutions.

The review schedule included the following components:

- Community Notification;
- Document Review;
- Data Review;
- Site Inspection; and
- Five-Year Review Report Development and Review.

Community Involvement

In March 2005, the RPM discussed the need to notify the community of the upcoming Five-Year Review with Robert Paulson, U.S. EPA's Community Involvement Coordinator (CIC). In May 2005, the EPA's Public Affairs Office placed an ad in the local newspapers announcing that the Five-Year Review was in progress and requesting that any interested parties contact EPA personnel for additional information. Please see a copy of the ad in Appendix B. Since the ad has been issued, no member of the community has notified USEPA of any interest in the Five-Year Review.

Document Review

The Five-Year Review consisted of a review of relevant documents including:

- *Ionia City Landfill Record of Decision*, U.S. EPA September, 2000
- *Ionia City Landfill Pump & Treatment Evaluation Tech Memo*, ENSR, January 2001
- *Ionia City Landfill 4th Quarter Operations & Maintenance Plan Status (2000)*, FTC&H, February 26, 2001
- *Ionia City Landfill 1st Quarter 2001 Operations & Maintenance Plan Status, Groundwater Data*, FCT&H, April 26, 2001
- *Ionia City Landfill LTRA SOW (Draft)*, U.S. EPA August 7, 2001
- *Ionia City Landfill Plume Status Report*, ENSR September 6, 2001
- *Ionia City Landfill 3rd Quarter 2001 Operations & Maintenance Plan Status Report*, FTC&H, November 7, 2001
- *Ionia City Landfill Groundwater Maps*, FCT&H, December 10, 2001
- *Ionia City Landfill LTRA Work Plan (Final 8/8/02)*, U.S. EPA February 28, 2002
- *Ionia City Landfill Tech memo for evaluating capture of the Groundwater Pumping System Phase II*, ENSR, 13 May 2002 (Received May 16, 2002)
- *Ionia City Landfill 2nd Quarter 2002 Operations & Maintenance Plan Status Report*, FCT&H, August 20, 2002
- *Ionia City Landfill Flow Map ID 500 mg/L Plume from VAS Data*, ENSR, December 11, 2002
- *Ionia City Landfill VAS Phase II Work Plan*, ENSR, January 2003
- *Ionia City Landfill Rehabilitation of Recovery Wells*, ENSR, July 31, 2003
- *Ionia City Landfill 1st Quarter 2003 Operations & Maintenance Plan Status Report*, FCT&H, May 12, 2003
- *Ionia City Landfill Tech memo Installation of Groundwater Monitoring Wells*, ENSR, August 20, 2003
- *Ionia City Landfill Treatment System Shutdown*, ENSR, September 3, 2003
- *Ionia City Landfill Monitoring Well Installation Report*, ENSR, August 20, 2003
- *Ionia City Landfill Plume Capture Report (Revised)* GZA, December 10, 2003
- *Ionia City Landfill Data, Groundwater Elevations*, FTC&H, May 2004
- *Ionia City Landfill 4th Quarter 2003 Operations & Maintenance Plan Status Report*, FTC&H, June 2, 2004
- *Ionia City Landfill 1st Quarter 2004 Operations & Maintenance Plan Status Report*, FTC&H, July 7, 2004
- *Ionia City Landfill 2nd Quarter 2004, Operations & Maintenance Plan Status Report*, FTC&H, December 20, 2004
- *Ionia City Landfill 3rd Quarter 2004 Operations & Maintenance Plan Status Report*, FTC&H, March 8, 2005
- *Ionia City Landfill Initial Monitored Natural Attenuation Report*, GZA, June 16, 2005

Data Review

Quarterly Sampling for Operation and Maintenance (O&M) System Status

The PRP Group began quarterly monitoring of groundwater contamination at the Site as part of their Long Term Response Action Workplan. Monitoring wells were added to the original sampling list to provide a comprehensive evaluation of the Site.

The pump and treat system performed poorly from the beginning of the O&M quarterly monitoring to 2004's fourth quarter. The system's performance was hampered by poor operation protocol and recovery well maintenance and equipment malfunction. The PRP Group improved the pump and treat system operations late in 2004 and operations improved from 32% operating rates to above 90%. Improvements and changes made by the PRP Group included regularly scheduled recovery well maintenance and the elimination of the pretreatment system (air-stripper) from the process. The PRP Group also improved their response time after receiving notification of alarmed conditions from days to hours. The pretreatment of the effluent waste stream was eliminated when the PRP Group provided documentation to USEPA and MDEQ that they would be in compliance with the City of Ionia's discharge limits without the pretreatment of the groundwater. This change had a large impact on increasing the system's operational hours.

The Site's contaminated groundwater plume has been better defined during this past five-year period. Data has been collected in outlying areas, which allowed the PRP Group to close the data gaps that previously existed at the Site. The current analytical results from the expanded monitoring well network indicate that the concentrations of concern (total VOCs) have remained stable in Area A, but do not appear to be decreasing significantly through natural attenuation. Contaminants of concern have been discovered in Area B, possibly indicating the loss of capture or a poorly defined original total VOC plume (See Figure 2).

Vertical Aquifer Sampling (VAS) Study (November 2002 – December 2002)

The VAS Study was conducted to close pre-existing data gaps and determine locations for additional monitored natural attenuation (MNA) wells. The VAS Study was conducted in 2002 and helped in providing real time information for the Site.

During this sampling effort, a large plume of greater than 500 µg/l total VOCs was found in Area B, which was previously thought to be below the ROD-required total VOC limit of 500 µg/l. Monitoring wells were subsequently installed in areas of high concentrations in Area B and these monitoring wells were added to the quarterly sampling efforts.

Long Term Monitored Natural Attenuation

A Long Term Monitored Natural Attenuation (LTMNA) Study work plan outlining the procedures and steps necessary for the development of the LTMNA monitoring well

network was submitted by the PRP Group. To support the LTMNA recommendation, two reports have been prepared by the PRP Group depicting their interpretation that the system is performing adequately. The first Plume Status Report (September 2001) provided information that failed to prove the system's capabilities and resulted in the VAS Study mentioned above. The second report (Plume Capture Report, December 2003) provided various theories as to how plume capture has been achieved. Yet, there have been no conclusive explanations for the existence of the 500 µg/l plume in Area B provided to date and the Agencies believe that the plume may be a direct result of poor capture system operations and low capture rates that were initially experienced at the Site. Further monitoring is necessary to clearly determine if this is indeed a new source area or if the 500 µg/l plume in Area A has expanded into Area B.

Institutional Controls

The 2000 ROD outlined several ICs that would need to be implemented at the Site including:

- maintenance of the Site including vegetative cover,
- perimeter fencing with appropriate signage,
- use of deed restrictions to control development on the property,
- continued or enhanced controls to prevent future use of the contaminated groundwater; and
- prohibiting residential development in Areas A and B, but allowing commercial or industrial development of Areas A and B, so long as it did not adversely impact the ongoing groundwater remediation at the Site.

During the formation of this Five-Year Review, a request was made to the PRP Group to conduct a study of the status of implementing any ICs required by the ROD as a voluntary effort. The PRP Group conducted a detailed title search for parcels of land that contained portions of the Site and for parcels of land that are located adjacent to the Site to the west (See Appendix C for full Summary Report). The report concluded that the ICs in place within the Site boundaries are currently effective at preventing exposure, but additional protective requirements are needed on certain parcels to ensure that such protections remain in place in the future. The status of the ICs within or near the Site are summarized as follows:

- All of the land within the Site boundaries is zoned industrial, under which residential development is precluded.

- The City of Ionia owns all but a small strip of land within the Site boundaries. There are existing restrictions on drinking water wells in place on Area B, and action has been taken to impose stronger restrictions that run with the land, including an express prohibition on residential uses, site-wide. The portion of the Site not owned by the City is currently in discussions regarding the implementation of similar restrictions.

- Properties on the west side of Cleveland Street are not required to have the same level of restrictions imposed on them, but the City is pursing the possibility of acquiring some property along the Site in order to consolidate control over all of the properties in or near the Site.

Site Inspection

The RPM, MDEQ and U.S. EPA's contractor performed a Site inspection on July 13, 2005. Personnel from the PRP Group, the City of Ionia and their contractors accompanied the regulatory team during the inspection. The purpose of the inspection was to walk through the Site and assess the presence and condition of the pumping station, various monitoring wells, the landfill cap and existing cover and to gain a general idea of current Site conditions. During the visit the following were noted:

- Fencing was intact and was in good condition;
- Warning signs were posted across the fenced-in area (Area A);
- The pumping station was in operating condition and appeared to be orderly;
- The cap in Area A appeared to be in good physical condition and was supporting a wide variety of grasses; and
- All of the monitoring wells that were noted appeared to be in good condition.

Interviews

There were no interviews conducted or necessary during this Five-Year Review period as the community interest in this Site is minimal.

VII. TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision document?

A review of the data indicates that the remedies are functioning as intended by the two RODs to a certain degree. The known source area has been removed in Area A, but the contaminated groundwater plume remains at the Site. During the time period that the pump and treat system has been operational, the VOC concentrations in the contaminant plume appear to be stable in a majority of the monitoring wells in Area A. There are also high levels of VOCs in groundwater noted in Area B based upon monitoring data, and concentrations of vinyl chloride are still elevated in areas east of the Kanouse Drain and the Grand River. This implies that the plume in not being captured or there is an additional source in Area A/Area B. In general, residents are connected to the public drinking water supply for the City of Ionia and there is a very slim chance that any private wells exist in Area B, but this assumption needs to be verified.

The current recovery well system has been performing at higher withdrawal rates due to better operation and maintenance and the bypass of the air-stripper. Yet it is unclear if the current recovery well system can capture the contaminated groundwater plume in Area B. Additional monitoring is necessary to assist with this determination.

Operation and maintenance of the landfill cap has been effective. The removal of the source area and placement of a cap in Area A has achieved the remedial objectives to protect human health and the environment by minimizing direct contact with contaminated soil.

It is still expected that the current remedy will eventually reduce groundwater contaminant concentrations to acceptable levels with some expanded monitoring and/or recovery well activities.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

There have been no changes in the physical condition of the Site that would affect the protectiveness of the remedy.

Changes in Standards and To Be Considered (TBC)

The source area in Area A was completely removed and a cap installed so no cleanup standards were established for the soil.

The only groundwater cleanup level established was the requirement of the PRPs to capture the 500 µg/l total VOCs plume.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

There have been no changes in the toxicity factors for the contaminants of concern that were used in the risk assessment and there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

While in the process of preparing this 5-year review, a study was conducted to evaluate the ICs that were selected to be implemented in the 2000 ROD. Several inconsistencies with ICs were found during this study and since then, have been adequately addressed to comply with the ROD.

Technical Assessment Summary

According to the review of the current data, ARARs, risk assumptions and the results of the Site inspection, it cannot be determined if the current groundwater remedy is functioning as intended. Since the current pump and treat system began functioning at a higher level in the recent past, it will require additional monitoring to determine the extent of plume capture and whether additional recovery wells are necessary at the Site to fully capture the contaminated groundwater plume.

As stated in the 2000 ROD, due to the removal of the source area, the need for further remediation of the soil has been eliminated. Therefore, an evaluation of the soil remedy is not necessary.

There have been no changes in the physical condition of the Site that would affect the protectiveness of the remedy. The remedies have been implemented in accordance with the design plans. There is no other information available that calls into question the protectiveness of the remedy.

VIII. ISSUES

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Lack of groundwater plume capture implied by stable contamination concentrations (pump and treat system performance)	N	Y
The plume is not fully defined per the guidance documents set forth to govern sites that utilize MNA	N	Y
There is a concern as to the reliability of the hydraulic conductivity testing conducted in past Site activities	N	N
Possibility of private or public drinking water wells down-gradient of Site	N	Y
Restrictive Covenant for Area A and recreational path (ICs) and follow up on IC Study findings	N	Y
Compliance with MDEQ's Mixing Zone Determination as stated in the 2000 ROD	N	Y

IX. RECOMMENDATIONS AND FOLLOW UP ACTIONS

Issue	Recommendations/Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Hydraulic Conductivity	Possibility of hydraulic conductivity evaluation of existing data at each well; hydraulic conductivity testing at selected wells within the system;	PRP Group	MDEQ and EPA	2005 and 2006	N	N
Plume Definition/ Plume Capture and Pump/Treat	VAS Study in areas to define the limits of the plume; continue quarterly sampling of all the selected monitoring wells along with measurement of the groundwater elevations at each well; development of a site-wide groundwater flow and contamination transport model; and O&M System improvements including increased recovery rates and area coverage (if needed)	PRP Group	MDEQ and EPA	2005 thru 2006	N	Y
MNA	Monitoring well network expansion to allow for eventual MNA	PRP Group	MDEQ and EPA	2005 thru 2006	N	Y
Down-gradient drinking wells	Assess the public or private drinking water wells in the down-gradient direction of the Site	PRP Group and MDEQ	MDEQ and EPA	2005 thru 2006	N	Y

ICs	Revise IC Study Report addressing Agency's concerns	PRP Group	MDEQ and EPA	2005	N	N
Mixing Zone	Review ROD requirements for the discharge limits to the Grand River and Kanouse Drain – include metals for future groundwater sampling events	PRP Group	MDEQ and EPA	2005 thru 2006	N	Y

X. PROTECTIVENESS STATEMENT

Due to the removal of the source area, the need for further soil remediation at the Site has been eliminated. Yet, a protectiveness determination of the remedy at the Site cannot be made at this time until further information is obtained due to the contaminated groundwater plume. Further information will be obtained by continued monitoring of the Site's contaminated groundwater plume as described in the above Recommendations and Follow-up Action. It is anticipated that these actions will take approximately one year to complete, at which time a protectiveness determination will be made.

XI. NEXT REVIEW

The next Five-Year Review for the Ionia City Landfill Superfund Site is required by September 2010, five years from the date of this review.

Figure 1 – Site Location

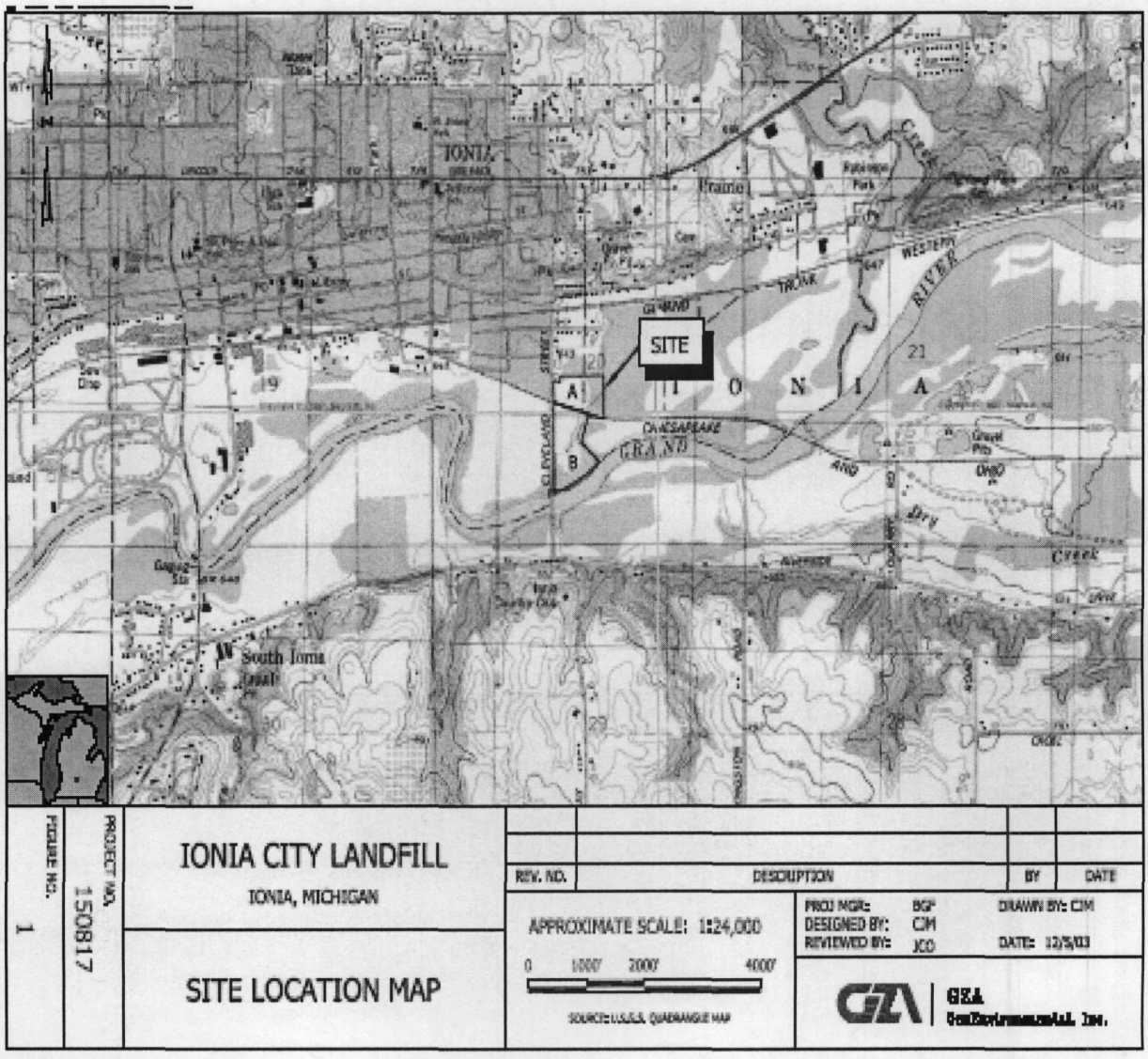
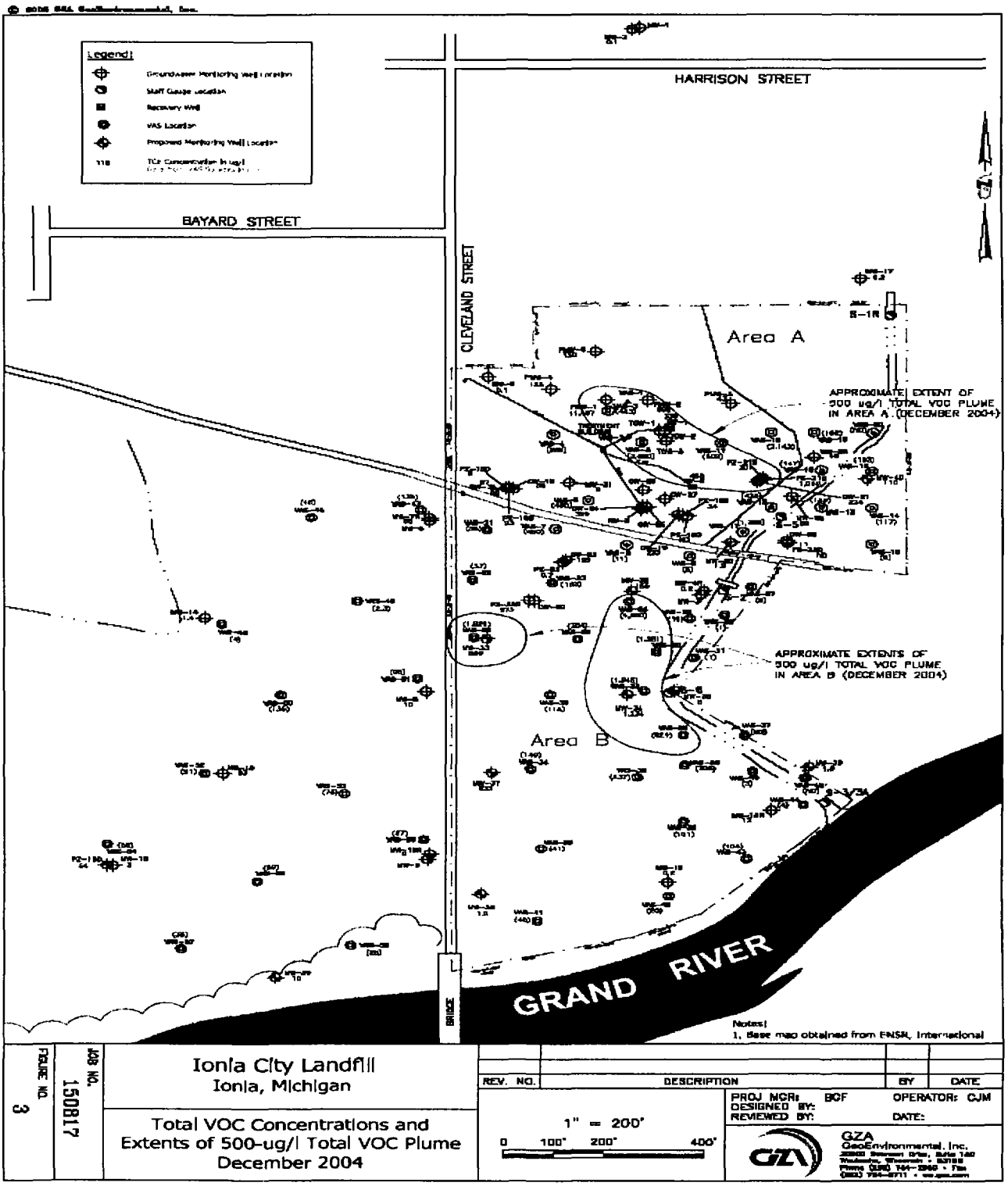


Figure 2 – Total VOC Groundwater Plume December 2004



APPENDIX A

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

I. SITE INFORMATION

Site name: Ionia City Landfill	**Date of inspection:** 7/13/05
Location and Region: Ionia, Mi, Region 5	**EPA ID:** MID980794416
Agency, office, or company leading the five-year review: U.S. EPA	**Weather/temperature:** warm 90°

Remedy Includes: (Check all that apply)

- ☑ Landfill cover/containment
- ☑ Access controls
- ☑ Institutional controls
- ☑ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other _____
- ☑ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Ken Wiley / FTC-H _____ 7/13/05
   Name / Title / Date
   Interviewed ☑ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Bernie Fenelon / GZA _____ 7/13/05
   Name / Title / Date
   Interviewed ☑ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency City of Ionia
Contact Tom Wieczorek — City Manager — _____ — _____
Name — Title — Date — Phone no.
Problems; suggestions; ☐ Report attached _____

Agency MDEQ
Contact Cindy Fairbanks + Bill Bolio — _____ — _____ — _____
Name — Title — Date — Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ — _____ — _____ — _____
Name — Title — Date — Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ — _____ — _____ — _____
Name — Title — Date — Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☐ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☐ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☐ N/A

Remarks _____

2.	**Site-Specific Health and Safety Plan**	☑ Readily available	☑ Up to date	☐ N/A
	☐ Contingency plan/emergency response plan	☑ Readily available	☑ Up to date	☐ N/A
	Remarks			
3.	**O&M and OSHA Training Records**	☑ Readily available	☑ Up to date	☐ N/A
	Remarks			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☑ N/A
	☑ Effluent discharge	☑ Readily available	☑ Up to date	☐ N/A
	☑ Waste disposal, POTW	☑ Readily available	☑ Up to date	☐ N/A
	☐ Other permits	☐ Readily available	☐ Up to date	☑ N/A
	Remarks			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks			
7.	**Groundwater Monitoring Records**	☑ Readily available	☑ Up to date	☐ N/A
	Remarks			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☑ N/A
	Remarks			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☑ N/A
	☐ Water (effluent)	☑ Readily available	☑ Up to date	☐ N/A
	Remarks			
10.	**Daily Access/Security Logs**	☑ Readily available	☐ Up to date	☐ N/A
	Remarks			

IV. O&M COSTS

1.	**O&M Organization**	
	☐ State in-house	☐ Contractor for State
	☑ PRP in-house	☑ Contractor for PRP
	☐ Federal Facility in-house	☐ Contractor for Federal Facility
	☐ Other	

2. **O&M Cost Records**
☑ Readily available ☑ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☐ N/A

A. Fencing good condition

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A
Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks good condition of signs need occassional replacement - kept up to date

C. Institutional Controls (ICs) Fencing, deed restrictions

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☑ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☑ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by) drive by + walk thrus

Frequency often

Responsible party/agency City, FTC+H, GZA

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☑ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks During the IC study some restrictions were changed to make site more restrictive (deed restrictions)

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☐ No vandalism evident

Remarks _____

2. **Land use changes on site** ☑ N/A

Remarks _____

3. **Land use changes off site** ☑ N/A

Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☑ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A

Remarks _____

B. Other Site Conditions bike / walking path

Remarks Kept in good condition

VII. LANDFILL COVERS ☑ Applicable ☐ N/A

A. Landfill Surface good condition

1. **Settlement** (Low spots) ☐ Location shown on site map ☑ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** ☐ Location shown on site map ☑ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☑ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** ☐ Location shown on site map ☑ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** ☑ Grass ☑ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☑ N/A
   Remarks_____

7. **Bulges** ☐ Location shown on site map ☑ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
   ☑ Wet areas ☐ Location shown on site map Areal extent_____
   ☐ Ponding ☐ Location shown on site map Areal extent_____
   ☐ Seeps ☐ Location shown on site map Areal extent_____
   ☐ Soft subgrade ☐ Location shown on site map Areal extent_____
   Remarks The Kanouse Drain is a drain system that flows toward the Grand River - normal

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☑ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☑ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☑ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☑ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☑ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☑ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☑ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☑ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☑ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☑ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☑ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☑ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☑ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☑ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs Maintenance
Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☐ Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing and Electrical**
☐ Good condition ☒ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☒ Good condition ☐ Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☒ Applicable ☐ N/A off line - direct discharge to POTW

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☒ Air stripping ☐ Carbon adsorbers
☐ Filters
☐ Additive (*e.g.*, chelation agent, flocculent)
☐ Others
☒ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually
☐ Quantity of surface water treated annually
Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks

5. **Treatment Building(s)**
☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
☒ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

D. Monitoring Data

1. Monitoring Data
☐ Is routinely submitted on time ☐ Is of acceptable quality

2. Monitoring data suggests: TBD - still evaluating data
☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☑ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

APPENDIX B

COPY OF FIVE YEAR REVIEW AD

U.S. Environmental Protection Agency

Will Start a Five-Year Review of the

Ionia Sanitary Landfill Superfund Site

Ionia, Michigan

EPA is conducting a five-year review of the cleanup at the Ionia Sanitary Landfill Superfund site. The review will check the site operations and maintenance plan for monitoring ground-water quality and over all effectiveness of the cleanup. The review is required to ensure the selected plan continues to protect human health and the environment. This review is scheduled to be completed by September 2005, and the next five-year review will be in 2010.

Public comment is highly encouraged. Written comments should be postmarked no later than Aug. 5, 2005

Site information can be found at:
Hall-Fowler Memorial Library
125 E. Main St.
Ionia

Written or oral comments should be addressed to Robert Paulson. Additional site information can be requested from the team members listed below.

Demaree Collier
Remedial Project Manager
EPA Region 5 (SR-6J)
77 W. Jackson Blvd.
Chicago, IL 60604
(312) 866-0214
collier.demaree@epa.gov

Robert Paulson
Community Involvement Coordinator
EPA Region 5 (P-19J)
77 W. Jackson Blvd.
Chicago, IL 60604
(312) 866-0272
paulson.robert@epa.gov

Toll free (800) 621-8431, 10 a.m. to 5:30 p.m. weekdays

APPENDIX C

IC STUDY REPORT
(Summary w/o attachments)

MILLER CANFIELD

MILLER, CANFIELD, PADDOCK AND STONE, P.L.C.

MEMORANDUM

TO: Demaree Collier
Remedial Project Manager, Superfund Division
United States Environmental Protection Agency, Region 5

CC: Edward B. Witte, Esq., Foley & Lardner
Kenneth Wiley, FTC&H
John Osborne, GZA GeoEnvironmental
Cindy Fairbanks, MDEQ
Daniel Balice, Mayor of the City of Ionia

FROM: Thomas C. Phillips, Esq.
Polly Ann Synk, Esq.

RE: Ionia City Landfill Superfund Site Institutional Controls Report

DATE: July 8, 2005

Dear Ms. Collier:

On behalf of the City of Ionia, we are submitting the attached report on the status of the institutional controls in place at the Ionia City Landfill. This report was completed in response to the request made by the United States Environmental Protection Agency ("EPA") in a letter dated March 3, 2005. Pursuant to that letter, the EPA sought the cooperation of potentially responsible parties at Superfund sites in compiling and reporting on the protectiveness, effectiveness, and integrity of the institutional controls required at those sites.

We appreciate the cooperation and guidance that you have afforded us in the process of preparing this report, and we look forward to working with you to provide information that is helpful and useful both to the City of Ionia and to the EPA in the future.

Sincerely,

Thomas C. Phillips

Polly A. Synk

Introduction and Purpose

The City of Ionia has prepared this Institutional Controls Report ("report") on behalf of itself and A.O. Smith Corporation ("A.O. Smith") in response to the March 3, 2005 letter from Ms. Demaree Collier of the United States Environmental Protection Agency ("EPA"). The subject site, the former Ionia City Landfill ("the Site"), is subject to a Consent Decree entered on May 3, 2002, implementing the Record of Decision (ROD) and Statement of Work (SOW) issued in 2000.

The ROD includes institutional controls as an element of the selected remedy for the Site. The institutional controls required in the ROD, and incorporated in the Consent Decree, include:

- Maintenance of the site, including vegetative cover, perimeter fencing, and warning signs, and other appropriate support facilities
- Use of deed restrictions to control development of the property
- Continued and/or enhanced controls to prevent future use of the contaminated groundwater.

The ROD also notes that residential development in Areas A and B is prohibited, although commercial or industrial development may be allowed as long as no adverse impact to groundwater remediation would result.

This purpose of this report is to fulfill the requirements for the implementation of institutional controls under the 2000 ROD and the 2002 Consent Decree, and to provide information responsive to the EPA's March 3, 2005 request.

Background and History

The Ionia City Landfill (the "Site") is located in the southeast corner of the City of Ionia, Michigan, approximately 30 miles east of Grand Rapids. The Site is bordered by Cleveland Street to the west, the Grand River to the South, an intermittent drainage ditch known as the Kanouse Drain to the east, and a light commercial/residential area to the north. The Site consists of two areas of fill: Area A is situated north of the railroad-turned-recreational trail (formerly the Chesapeake and Ohio Railroad, also known as the Pere Marquette Railroad), and Area B is south of the trail and extends to the Grand River. The Site location is shown in Exhibit A.

In 1983, the Site was placed on the National Priorities List pursuant to Section 105 (42 U.S.C. § 9605) of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. §§ 9601 *et seq.* The City of Ionia conducted a removal action at the site in 1984, constructing a fence around the northern portion of the Site, removing and disposing of exposed drums in the northern portion of the Site, and placing a clay cap over areas affected by the drum removal. In 1985, additional exposed drums were removed, a security fence was installed, and warning signs were posted.

In 1986, EPA entered into an agreement with A.O. Smith and Mitchell Corporation to conduct a Remedial Investigation/Feasibility Study (RI/FS). Following completion of the RI/FS, the EPA determined that the "point source" of contamination (buried drums, bulk wastes, and contaminated soils) required cleanup, and signed a Record of Decision ("ROD") in 1989 that selected a remedy of (1) in-situ vitrification ("ISV") of approximately 5,000 cubic yards of drummed waste and contaminated soils

within a defined one-quarter acre area of the Site (the "point source area"), (2) monitoring in the A-1 aquifer, (3) an upgrade for the landfill cover and cap, and (4) institutional controls. Eighteen potentially responsible parties ("PRPs") signed a consent decree to implement the ISV remedy selected in the 1989 ROD.

In the course of preparing the site for ISV in 1992, drums containing liquids were removed from the Site for offsite disposal, but the removal resulted in damage to some drums, spilling their contents into the soils of the area designated for ISV treatment. Following these spills, the waste materials that were not transported offsite, including drum fragments and contaminated soils, were distributed evenly over the area designated for treatment, recompacted and covered with a clay layer and a geomembrane. Testing in late 1993 revealed problems with the proposed remedy at the site, and the application of ISV technology in general became questionable around this time. Groundwater monitoring at the Site in November 1993 revealed that groundwater quality immediately downgradient of the area prepared for ISV was deteriorating, most likely due to the ISV preparation work performed in 1992.

In a letter to the PRPs dated April 18, 1994, the EPA determined that site conditions, attributed to releases from the "point source area" prepared for ISV, may have constituted an imminent and substantial endangerment to the environment. As a result, the EPA entered into an Administrative Order by Consent ("AOC") dated October 24, 1994 (No. V-W-'95-C-264) with the PRPs to implement a soil removal action in the "point source area." The EPA sent a letter to the PRPs, informing them that all work

required under the October 24, 1994 AOC had been fully performed (with the exception of continuing obligations).

On June 13, 1995, the EPA approved another AOC (No. V-W-'95-C-311) with six of the PRPs to implement another removal action addressing groundwater impacted by volatile organic chemicals (VOCs). The 1995 AOC identified the work to be implemented as a pump and treat system within the northern portion of the site ("Area A") that would "obtain hydraulic control in a manner that prevents the discharge of unacceptable levels of contamination to the Grand River and insures continued protection of the Grand River ecosystem." The pump and treat system became fully operational in May 1999, and on September 28, 2000, the EPA executed a ROD selecting a final remedy for groundwater at the Site. The EPA and eight settling defendants entered into a Consent Decree implementing the ROD, which was signed by the parties in March 2002 and entered in the United States District Court of Michigan, Western District, on May 3, 2002. Operation and maintenance of the pump and treat system in accordance with the October 25, 2002, Long Term Response Action Work Plan, including quarterly groundwater monitoring and assessment of plume capture, was initiated in December 2002 and continues to the present.

GZA Geoenvironmental Inc. submitted a Plume Capture Report on behalf of the PRP group in December 2003 that concluded that plume capture had occurred over the 500ug/l total VOC plume for the period evaluated, and further recommended ongoing evaluation of plume capture, to be included in each quarterly operations and maintenance (O&M) report. The Michigan Department of Environmental Quality (MDEQ) and the

EPA agreed that additional evaluation of plume capture was necessary before a final conclusion could be reached. In addition, GZA recently submitted a Monitored Natural Attenuation (MNA) Groundwater Sampling Summary report setting forth the results of MNA well installation and testing activities, results of the initial round of MNA sampling, and recommendations for the installation of additional MNA monitoring wells.

Properties Covered by this Report

A map depicting the property boundaries in the general area of the Site and their tax identification numbers is attached in paper form at Exhibit B, and is also provided on a CD-ROM at Exhibit H. This report conducted a title search for parcels (1) that contain portions of the Site and therefore clearly require land and groundwater restrictions as identified in the ROD and Consent Decree, and (2) parcels that are adjacent to the Site to the west. The title work for those six properties are found at Exhibit B, with accompanying legal descriptions and certified copies of any existing covenants, easements, or other proprietary controls affecting the property.

B (1): # 204-120-000-240-00

The property described in detail in Exhibit B(1) contains the northern part of the Site, known as Area A. This parcel is owned by the City of Ionia, and the results of a title search of the property are found at Exhibit B(1). Following the placement of the Site on the National Priorities List by the EPA, the City erected a six-foot fence topped with barbed wire around the perimeter of the Site. Photographs of the fencing around Area A are attached to this report as Exhibit F(1)-(11). Warning signs are also posted on the fence. See photographs at Exhibit F(1)-(3), (7)-(11).

The entire parcel is zoned I-1 industrial, which precludes the use of any portion of the parcel for residential purposes. See City of Ionia Zoning Map, Exhibit D. Ionia's zoning code Chapter 1262, I-1 Light Industrial District, sets forth the uses permitted in the I-1 zoning district, which do not include residential use. See Exhibit E, Chapter 1262 of the City of Ionia Planning and Zoning Code. The intent of the district includes the following statement: "To protect abutting Residential Districts by separating them from manufacturing activities, and by **prohibiting the use of such industrial areas for new residential development.**" See Exhibit E, p. 2.

The title search did not yield existing prohibitions on the use of the property for residential purposes or a prohibition on the digging or use of wells for drinking water for this parcel. Since such restrictions are necessary to comply with the ROD and Consent Decree, the City of Ionia City Council convened on Monday, June 27, 2005 and passed a resolution authorizing the City Manager to file such a restrictive covenant, running with the land, with the Register of Deeds. See Exhibit I. The restrictive covenant imposed on the property that will be filed with the Register of Deeds is attached as Exhibit J. When the restrictive covenant is filed, a stamped copy will be sent to the EPA, the MDEQ, and to representatives of A.O. Smith to confirm its entry.

B(2): # 203-240-000-220-00

The property described in detail in Exhibit B(2) consists of a strip of land that was formerly owned and used as a railroad. The documents in Exhibit B(2) detail the sale of the land to the City of Ionia, the current owner. This parcel is now used as a recreational

trail that is paved. See photographs of trail, including fencing and warning signs around site at Exhibit F(7)-(11).

The portions of the parcel within the Site and near the Site are zoned I-1 industrial, which precludes the use of any portion of the parcel for residential purposes, as explained above. See City of Ionia Zoning Map, Exhibit D.

The title search for this parcel did not yield existing prohibitions on the use of the property for residential purposes or a prohibition on the digging or use of wells for drinking water for this parcel. Since such restrictions are necessary to comply with the ROD and Consent Decree, the City of Ionia passed a resolution authorizing the imposition of a restrictive covenant, running with the land, on this parcel, barring residential uses and the digging, drilling or use of drinking water wells. See Exhibits I, J. When the restrictive covenant is filed, a stamped copy will be sent to the EPA, the MDEQ, and to representatives of A.O. Smith to confirm its entry.

B(3): # 203-240-000-120-00

The property described in detail in Exhibit B(3) contains the southern part of the Site, known as Area B. This parcel is owned by the City of Ionia, and the results of a title search of the property are found at Exhibit B(3). A quit-claim deed was executed by the City of Ionia to itself in 1996, citing the entry of a Consent Decree with regard to the Site dated June 17, 1991 in the United States District Court for the Western District of Michigan. See Exhibit B(3), liber 532, page 3673. This quit-claim deed prohibited the digging, drilling, or use of water wells on the subject property. See Exhibit B(3), liber 532, page 3673.

The entire parcel is zoned I-1 industrial, which as noted above precludes the use of any portion of the parcel for residential purposes, as explained above. See City of Ionia Zoning Map, Exhibit D.

Although there are land use restrictions already in place for this parcel, the resolution passed by the City authorized the placement of a restrictive covenant on this city-owned property as well as the other properties in order to improve and strengthen the protections applicable to the Site. The quit-claim deed imposed restrictions on the use of the property, but the new restrictive covenant expressly runs with the land and binds any successors in interest unless and until the EPA determines that such restrictions are no longer necessary and amends or rescinds the restriction in writing. See Exhibit J. The restrictive covenant also provides that to the extent it conflicts with any earlier-imposed restrictions, the new restrictive covenant controls, thereby preventing conflict.

When the new restrictive covenant applicable to Area B is filed with the Register of Deeds, a stamped copy will be sent to the EPA, the MDEQ, and to representatives of A.O. Smith to confirm its entry.

B(4): # 203-240-000-045-00

The property described in detail in Exhibit B(4) consists of a strip of land just south of the former railroad and just east of Cleveland Street that is currently owned by Consumers Power Company ("Consumers"). The title search for this parcel revealed a quit claim deed from Consumers Power Company to the City of Ionia that appears to cover the property description listed in the tax rolls, but "excepts" from the conveyance

"a strip of land 33 feet wide lying East of and adjacent to the centerline of Cleveland Street." See Exhibit B(4), liber 447 page 399.

The title search for this parcel did not yield existing prohibitions on the use of the property for residential purposes or a prohibition on the digging or use of wells for drinking water for this parcel. Based on the lack of use restrictions, counsel for the City of Ionia contacted the legal department at Consumers to inquire about the possibility of imposing appropriate restrictions and to clarify the parties' respective interest in the land. Counsel have engaged in productive discussions that are continuing at this point with the goal of resolving the exact description of the land owned by Consumers and imposing necessary prohibitions on residential use and drinking water wells.

The parcel is zoned I-1 industrial, which already precludes the use of any portion of the parcel for residential purposes. See City of Ionia Zoning Map, Exhibit D. However, in order to provide the greatest level of protection possible, the City of Ionia will pursue additional express prohibitions on residential use on this property.

When progress is made with regard to restrictions on this parcel, the City of Ionia will provide documentation and/or descriptions of the actions taken to the EPA, the MDEQ, and to representatives of A.O. Smith.

B(5): # 203-240-000-040-00

The property described in detail in Exhibit B(5) consists of a strip of land across Cleveland Street from the Site, just south of the former Pere Marquette Railway, currently used as a recreational trail. The City of Ionia owns this parcel.

Although this parcel is not directly impacted by the institutional controls requirements in the ROD and Consent Decree, the City of Ionia conducted a title search on this parcel to confirm that the parcel is City-owned and free of encumbrances.

Although this parcel is not required to have restrictions, the entire parcel is zoned I-1 industrial, which precludes the use of any portion of the parcel for residential purposes, as explained above. See City of Ionia Zoning Map, Exhibit D.

B(6): # 203-240-000-020-00

The property described in detail in Exhibit B(6) is a field owned by the Trustees of the Virgil J. Pung and Marguerite H. Pung Family Living Trust. Mr. Pung died within the past twelve months, and is survived by Marguerite H. Pung. Representatives of the City of Ionia have approached Mrs. Pung about the possibility of purchasing the property, but such discussions are preliminary at present.

Historically, the land has been leased to area farmers for planting corn, and such use continues at present. See photograph of parcel at Exhibit F(12). There are monitoring wells on the parcel associated with the remedy being implemented at the Site. See photograph of parcel showing closeup of well at Exhibit F(13). Although this parcel is not directly impacted by the institutional controls requirements in the ROD and Consent Decree, the City of Ionia conducted a title search on this parcel to confirm ownership of the parcel and to ensure that the parcel is free of encumbrances.

In 2004, A.O. Smith executed an access agreement with Virgil Pung as the owner of the property, under which A.O. Smith and its representatives were granted access to

install, operate and sample monitoring wells on the property. See Exhibit G, Access Agreement. The agreement, though not filed with the Register of Deeds, expressly runs with the land, and is binding upon future owners of the property.

The parcel is zoned I-1 industrial, but continues to be planted with corn due to its location within the flood plain and frequent flooding, which make development an unattractive option. See City of Ionia Zoning Map, Exhibit D. In order to provide the greatest level of protection possible, the City of Ionia will pursue additional express prohibitions on residential use on this property, either as the purchaser of the property, or in cooperation with the current or future owners.

When progress is made with regard to restrictions on this parcel, the City of Ionia will provide documentation and/or descriptions of the actions taken to the EPA, the MDEQ, and to representatives of A.O. Smith.

Conclusion

The institutional controls in place within the Site boundaries are currently effective at preventing exposure, but additional protective restrictions are needed on certain parcels to ensure that such protections remain in place in the future. The status of institutional controls within or near the Site can be summarized as follows:

- All of the land within the Site boundaries is zoned I-1 Industrial, under which residential development is precluded. Thus, even where such restrictions are not currently in place, residential construction and/or use would not be permitted.

- The City of Ionia owns all but a small strip of land within the Site boundaries, and access is restricted by fencing and signage that are maintained by the City. There are existing restrictions on drinking water wells in place on the portion known as Area B, and action has been taken to impose stronger restrictions that run with the land, including an express prohibition on residential uses, site-wide, and to record those restrictions with the Register of Deeds. The portion of the Site that is owned by Consumers is the subject of discussions regarding implementation of similar restrictions.
- Properties on the west side of Cleveland Street are not required to have the same level of restrictions imposed upon them, but the City of Ionia is nevertheless pursuing the possibility of acquiring the property directly across the street and bordering the Grand River in order to consolidate control over these properties in the City.

In conclusion, the controls in place at or near the Site are protective in the short term, and will be made more protective in the long term following the implementation of the actions recommended in this report.

Appendix

A. Map of Area (courtesy of Fishbeck, Thompson, Carr & Huber)

B. Title work for properties required to have land and groundwater use restrictions, and nearby properties

1. **204-120-000-240-00**
2. **203-240-000-220-00**
3. **203-240-000-120-00**
4. **203-240-000-045-00**
5. **203-240-000-040-00**
6. **203-240-000-020-00**

C. GIS map of site with parcels identified by boundary and tax identification number

D. Zoning map (part) of City of Ionia showing Site

E. City of Ionia Planning and Zoning Code Chapter 1262, I-1 Light Industrial District

F. Photographs of Site

1. **Fencing and sign #1 facing Cleveland Street**
2. **Fencing and sign #2 facing Cleveland Street**
3. **Facing northeast looking at northern portion of Site from across Cleveland Street, with view of building housing pumping and treatment equipment and additional yellow warning signs**
4. **Monitoring well in northern portion of Site**
5. **Wells in parking area for river trail, facing north, with view of additional yellow warning signs**
6. **Inside fenced area**

7. **Fencing and warning signs in parking area for river trail**

8. **Fencing along river trail**

9. **Fencing along river trail**

10. **Fencing and signage at boundary of Site along river trail**

11. **Property west of Cleveland Street across from the Site, well visible in foreground**

12. **Closeup of well on property west of Cleveland Street across from the Site**

G. Access Agreement Applicable to Pung Property west of Cleveland Street (#203-240-000-020-00)

H. CD-ROM with GIS map of area

I. Resolution approved by Ionia City Council Authorizing the Imposition of Restrictive Covenants on Three City-Owned Properties

J. Restrictive Covenant to be Filed with Register of Deeds

LALIB:135193.1\043155-00005
06/21/05